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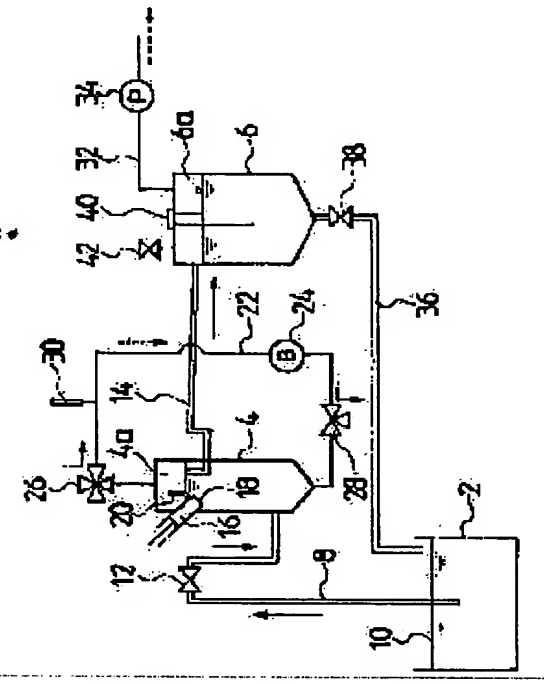
(54) ACTIVITY EVALUATION TESTING SYSTEM

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an activity evaluation testing system by promptly metering the oxygen consumption rate with high accuracy.
SOLUTION: The reactor (4) is equipped with a means metering the oxygen dissolved (DO) in the liquid in the reactor (4) and a means metering the oxygen (O2) in the upper gas phase and a certain amount of a microorganism mixture is introduced into the reactor (4) from the microorganism mixing tank (2) on the outside by evacuating the inside of the reactor (4). The activity of a microorganism is evaluated by metering the DO concentration in the culture mixture and the O2 concentration in the gas tightly closed in the upper part (4a) of the reactor (4).



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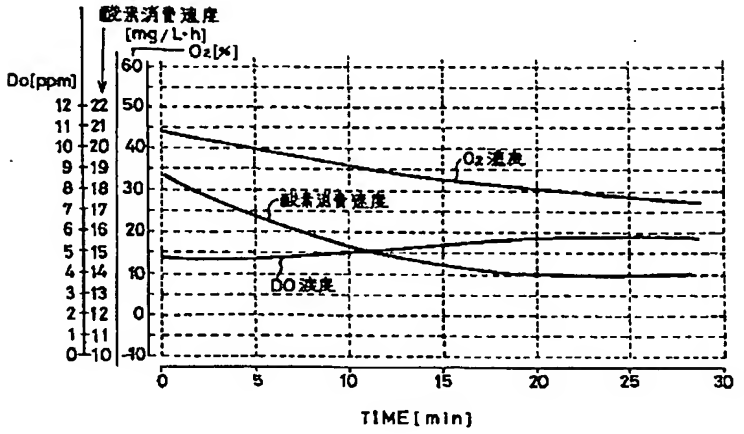

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DETAILED DESCRIPTION

[Detailed description]
[0001]
[The technical field to which invention belongs] this invention relates to the activity evaluation testing device which measures the oxygen consumption coefficient of a microorganism required in order to start an activity evaluation testing device, especially to evaluate activity, such as organic substance oxidization of the condition monitoring of a processor, or a microorganism, and a nitrification, in the biological waste treatment of waste water.
[0002]
[Prior art] Generally by the technique of processing waste underwater the organic substance and a nitrogen component biologically, oxidization of the organic substance and the nitrification reaction of an ammoniacal nitrogen are used. For these reactions, since the oxygen consumption by the microorganism follows, activity, such as organic substance oxidization of the condition monitoring of a processor or a microorganism and a nitrification, can be evaluated on the basis of an oxygen consumption coefficient.

[0003] As the technique of measuring the oxygen consumption coefficient of a microorganism in a waste water treatment equipment, microorganism mixed liquor is extracted from a processing tub to the small reactor besides a tub, a microorganism reaction is advanced by the batch within a reactor, and the method of asking for the oxygen consumption coefficient in that case is learned. As technique of asking for the oxygen consumption coefficient of the microorganism mixed liquor extracted in the reactor, the technique of the following which used the dissolved-oxygen-concentration meter (DO meter) and/or the oxygen analyzer in a gaseous phase (O2 meter) is learned.

[0004] a) O2 in the gas which supplies air to a reactor and is discharged by the gaseous-phase section from microorganism mixed liquor The decrement speed of DO concentration is measured with DO meter, stopping an air supply and stirring microorganism mixed liquor, after raising concentration about several mg / L, and more than it.

b) O2 in the gas which supplies air to a reactor and is discharged by the gaseous-phase section from microorganism mixed liquor It is concentration O2 It measures in total and is O2 in a supply air (atmospheric air). An oxygen consumption coefficient is computed from the difference and supply air volume with concentration. In addition, when DO concentration changes, the change speed of DO concentration is measured with DO meter, and an oxygen consumption coefficient is amended.

[0005] c) Supplying air to a reactor, measure DO concentration of the mixed liquor of a microorganism and compute an oxygen consumption coefficient from the change speed and a generalization oxygen-transfer capacity coefficient (KLa).

Since instrumentation is completed when DO concentration of mixed liquor is set to 0mg / L, the technique of a) is used in order to measure only the oxygen consumption coefficient in early stages of the mixed liquor in a reactor.

[0006] On the other hand, since the technique of b and c continues and supplies air, it can continue and measure transition of the oxygen consumption coefficient accompanied by the microorganism reaction in a reactor. However, the technique of b is O2 in exhaust gas, when a reactor is used as a small container. The differences of concentration and that in the atmospheric air are very few, and have the problem that the measurement error of an oxygen consumption coefficient is comparatively large. In order that the technique of c) may convert an oxygen consumption coefficient using KLa which is an indirect index, although equipment is easy, since it is necessary to grasp the correlation with the parameter of water temperature or air-content others, there is a problem that instrumentation becomes complicated that what is necessary is to have only DO meter.

[0007]

[Object of the Invention] Now, when extracting the microorganism mixed liquor of a processing tub to a reactor, in order for the activity of a microorganism and the water quality of mixed liquor to change every moment, they need to terminate an extraction process for a short time by the high-speed style. Therefore, usually, although the **** pump of a high-speed style was used, in order that mixed liquor might contact the high-speed rotation section of a pump directly in that case, there was a case where the flocks of the microorganism in mixed liquor were destroyed in extraction of mixed liquor. Furthermore, when mixed liquor contained the support which fixed the microorganism in a front face or the interior, there was also a problem which may produce wear of the support [itself] and a breakdown by sublation of the microorganism from a carrier surface or the case.

[0008] As technique of extracting mixed liquor in a reactor, without using a **** pump, the inside of a reactor is decompressed with a reduced pressure pump, and the technique of attracting mixed liquor in a reactor with the negative pressure is learned. The equipment which enforces this technique changes a reactor into the reduced pressure status, and it attracts external liquid in a reactor by opening an inflow valve, when liquid level reaches the level gage installed in the reactor, it closes an inflow valve, it opens a breather valve further, and it is constituted so that the gaseous-phase section may be returned to atmospheric pressure. And after instrumentation makes internal liquid discharge from an exhaust valve, and it moves from it to the extraction process of the following liquid. External liquid can be extracted in a container by the high rate of flow, without producing wear of the support [itself], and a breakdown by sublation of the microorganism from a carrier surface, or the case, when mixed liquor contains further the support which fixed the microorganism in a front face or the interior, without according to this equipment mixed liquor's not contacting the high-speed rotation section of a pump directly, and destroying the flocks of the microorganism in mixed liquor.

[0009] However, DO meter for measuring DO concentration in internal mixed liquor, and O2

concentration in up gas to this reactor and O2 When introducing the total, time for DO meter to contact mixed liquor at the time of extraction of mixed liquor is short, and cannot fully answer DO concentration of mixed liquor. Therefore, in case instrumentation of DO concentration change of mixed liquor is started after an extraction end, delay of a response arises and accurate instrumentation cannot be performed. Moreover, the inside of a container will be in the reduced pressure status at the time of extraction of mixed liquor, and it is O2 in gas. Concentration and O2 Since the indicated value of the total falls, the gaseous-phase section is made into atmospheric pressure after an extraction end, and it is O2 in gas. In case instrumentation of concentration change is started, delay of a response arises and accurate instrumentation cannot be performed. furthermore, in introducing into this reactor the conventional DO electrode by which the electrolytic solution was held in the diaphragm In order to extract mixed liquor, when the inside of a reactor is changed into the reduced pressure status (600 or less Toors), When abnormalities -- the indicated value of DO electrode shows a temporary extremely high numeric value -- are seen, may fully be unable to answer DO concentration of the extracted mixed liquor and started instrumentation of DO concentration change of mixed liquor after an extraction end, delay of a response arose and accurate instrumentation was not completed.

[0010] In the equipment which this invention was made in view of such a situation, cancels the fault of the above-mentioned conventional technique, extracts microorganism mixed liquor to a reactor, and measures the oxygen consumption coefficient of a microorganism Sublation of the microorganism fixed the breakdown, the carrier surface, or inside the microorganism, and wear of the support [itself], [in mixed liquor] [of flocks] O2 of DO concentration of microorganism mixed liquor, and the up gaseous-phase section further extracted to the reactor, without producing a breakdown At the time of instrumentation start of change of concentration DO meter and O2 It is the indicated value of the total, respectively O2 in DO concentration in early stages of mixed liquor, and the atmospheric air It aims at offering the activity evaluation testing device which can measure an oxygen consumption coefficient with a sufficient precision by doubling with concentration certainly.

[0011]

[The means for solving a technical problem] In order to attain the aforementioned purpose, this invention the activity evaluation testing device of the claim 1 of this invention When a reactor has a means to measure the dissolved oxygen (DO) concentration in internal liquid, and the oxygen (O2) concentration in up gas and makes the inside of the aforementioned reactor the reduced pressure status It is constituted so that constant-rate extraction of the microorganism mixed liquor may be carried out into the aforementioned reactor from an external microorganism mixing chamber. It is O2 in DO concentration of mixed liquor, and gas, circulating through the gas sealed by the aforementioned reactor upper part in mixed liquor from the time of an extraction end of the mixed liquor to the aforementioned reactor. It is characterized by evaluating microorganism activity by measuring change of concentration.

[0012] Moreover, the activity evaluation testing device of the claim 2 of this invention It connects with the reduced pressure tank in which the aforementioned reactor has a capacity larger than the capacity in a claim 1. By decompressing the aforementioned reduced pressure tank and subsequently to in the aforementioned reduced pressure tank attracting microorganism mixed liquor in the aforementioned reactor from the exterior at the time of extraction of microorganism mixed liquor It is characterized by constituting so that the indicated value of DO meter with which the reactor was equipped may be doubled with DO concentration of mixed liquor, replacing the mixed liquor in the aforementioned reactor with the mixed liquor from the exterior.

[0013] Moreover, the activity evaluation testing device of the claim 3 of this invention is characterized by constituting in the aforementioned reactor, so that constant-rate extraction of the mixed liquor may be carried out by doubling with the liquid level of the mixed liquor in the aforementioned reactor the position of the interconnecting tube which connects the aforementioned reactor and the aforementioned reduced pressure tank in a claim 2. Moreover, the activity evaluation testing device of the claim 4 of this invention is characterized by returning the pressure of the decompressed gas section to atmospheric pressure in claims 1, 2, or 3 by attracting the open air among the up gas section of the aforementioned reactor at the time of an extraction end of microorganism mixed liquor.

[0014] When a reactor was changed into the reduced pressure status, it was guessed from various studies by attracting in a reactor the electrolytic solution held in the diaphragm of an electrode through a diaphragm as a cause by which the indicated value of DO electrode shows abnormalities that it is for

producing cavitation within the electrolytic solution. Then, the communicating tube which passes to the gaseous-phase section which a reactor is the same and was decompressed from the electrolytic-solution section is attached, and it constitutes so that attractive force may be produced in the orientation which negates the suction force through the diaphragm in the electrolytic solution.
[0015]
[Gestalt of implementation of invention] Hereafter, according to an accompanying drawying, it explains in full detail about the gestalt of desirable enforcement of the activity evaluation testing device of this invention. Drawing 1 shows the gestalt of 1 enforcement of this invention **** activity evaluation testing device. This equipment is constituted by the microorganism mixing chamber 2, the reactor 4, the reduced pressure tank 6, etc.
[0016] As for the reactor 4, the end of an inhalant canal 8 is connected to the lower part. A pars intermedia is started and, as for this inhalant canal 8, the other end is immersed in the microorganism mixed liquor 10 of the microorganism mixing chamber 2. And the inflow valve 12 is ****ed by the pars intermedia of an inhalant canal 8. Moreover, the end of an interconnecting tube 14 is arranged at the upper part of a reactor 4, and the other end of this interconnecting tube 14 is arranged at up (gaseous-phase section) 6a of the reduced pressure tank 6. Furthermore, a total of DO16 is installed in the upper part of a reactor 4. A total of this DO16 is equipped with a diaphragm 18 at the nose of cam, and it is arranging this diaphragm 18 in the position slightly lower than the end of the above-mentioned interconnecting tube 14. and it is equipped with the communicating tube 20 in which the other end was located more highly than the end of the above-mentioned interconnecting tube 14. [of 16 connecting this DO end to the interior] Moreover, the circulation line 22 which connects up (gaseous-phase section) 4a and the pars basilaris ossis occipitalis to this reactor 4 is formed, a circulating pump 24 intervenes in the interval of this circulation line 22, and the change-over valve 28 intervenes between this circulating pump 24 and up 4a of a reactor 4, respectively between the change-over valve 26 and the circulating pump 24, and the pars basilaris ossis occipitalis of a reactor 4. The above-mentioned change-over valve 26 is made to **** up 4a of a reactor 4 alternatively to the atmospheric air or the circulation line 22, and the above-mentioned change-over valve 28 ****s a circulation line 22 alternatively to the pars basilaris ossis occipitalis or the atmospheric air of a reactor 4. Furthermore, between the circulating pumps 24 and the change-over valves 26 in a circulation line 22, it is O2. A total of 30 being ****ed
[0017] The end of the siphon 32 is connected to up (gaseous-phase section) 6a, and, as for the reduced pressure tank 6, the reduced pressure pump 34 is installed in this siphon 32. The end of the drainage tube 36 is connected to the pars basilaris ossis occipitalis of this reduced pressure tank 6, and the other end of this drainage tube 36 is connected to the above-mentioned microorganism mixing chamber 2. And it is placed between these drainage tube 36 by the exhaust valve 38. Furthermore, the level gage 40 and the open valve 42 are installed in the upper part of this reduced pressure tank 6.
[0018] Gaseous-phase section (upper part) 4a of a reactor 4 is made into sealing structure, the exhaust gas from the microorganism mixed liquor in a reactor 4 is supplied into the mixed liquor in a reactor 4 with a circulating pump 24, and the activity evaluation testing device concerning this invention is DO concentration in that case, and O2. Each change of concentration is measured. And DO concentration and O2 An oxygen consumption coefficient is computed from the capacity of each change speed of concentration and mixed liquor, and the gaseous-phase section.
[0019] A sample (microorganism mixed liquor) is extracted with this equipment, and it is as follows when the example of operation which measures the oxygen consumption coefficient is shown for every process based on drawing 1 .
** If an open valve 42 is closed, the reduced pressure tank 6 is intercepted from the atmospheric air and the reduced pressure pump 34 is operated while a reactor 4 is intercepted from the atmospheric air with the change-over valve 26 of the sampling reactor 4, the reduced pressure tank 6 and the reactor 4 will be decompressed with the reduced pressure pump 34. then -- if the inflow valve 12 of an inhalant canal 8 is opened -- the microorganism mixing chamber 2 to the mixed liquor 10 -- a reactor 4 -- subsequently to the reduced pressure tank 6, it is drawn in If specified quantity **** of the mixed liquor is carried out at the reduced pressure tank 6 and an oil level results at the nose of cam of contact of a level gage 40, the inflow valve 12 will be closed and extraction of mixed liquor will be ended. Then, while a change-over valve 26 is operated and a reactor 4 is opened to the atmospheric air, an open valve 42 is opened and the reduced pressure tank 6 is opened to the atmospheric air. Then,

gaseous-phase section 4a of the reactor 4 upper part replaces the open air, and returns to atmospheric pressure with gaseous-phase section 6a of the reduced pressure tank 6. Consequently, into a reactor 4, constant-rate extraction of the mixed liquor is carried out by the same liquid level as the opening position of an interconnecting tube 14. Moreover, the excessive mixed liquor which remained in the reduced pressure tank 6 is returned to the microorganism mixing chamber 2 by opening an exhaust valve 38 after that at suitable time. In addition, it is intercepted from a reactor 4 with a change-over valve 26 and the change-over valve 28, and the atmospheric air ****s through those diverter valves 26 and 28, and the circulation line 22 from gaseous-phase section 4a of a reactor 4 to the pars basilaris ossis occipitalis of a reactor 4 at the time of extraction of mixed liquor is the open air by the circulating pump 24 simultaneously O2 in a line It is made a total of 30 passing and is O2. A total of 30 calibration is performed.

[0020] The capacity of the reduced pressure tank 6 consists of this activity evaluation testing device more greatly than that of a reactor 4. Therefore, the mixed liquor in a reactor 4 is replaced completely, a total of DO16 with which the reactor 6 was equipped can contact the mixed liquor which interchanges continuously during mixed liquor extraction, and its a total of DO 16 indicated value comes to correspond with DO concentration (initial value) of mixed liquor. In addition, a total of mixed liquor, and DO 16 contact time until extraction is completed can be easily adjusted with the bore of the capacity of the reduced pressure tank 6, the height of a level gage 40, the amount of suction of the reduced pressure pump 34, the inhalant canal 8, and the interconnecting tube 14, a length, etc., and are usually set up in 0.5 - 3 minutes.

** It is gas of gaseous-phase section 4a of the reactor 4 which operates the change-over valve 26 and the change-over valve 28 after extraction of the mixed liquor to the instrumentation reactor 4 of the oxygen consumption coefficient of a sample, connects a circulation line 22 to a reactor 4, and was sealed by the circulating pump 24 O2 in a line After making it a total of ****ing to 30, the mixed liquor in a reactor 4 is supplied from the pars basilaris ossis occipitalis of a reactor 4. and it is O2. A total of 30 being O2 in DO concentration of mixed liquor accompanied by the oxygen consumption by the microorganism reaction in the mixed liquor extracted to the reactor 4 since a calibration is completed using the open air and the gas of gaseous-phase section 4a of a reactor 4 was also replaced with the open air, and gas Change of concentration is measurable with a sufficient precision. [of 16 showing DO concentration in early stages of DO mixed liquor at the time of an extraction end of mixed liquor]

[0021] In addition, it is asked for an oxygen consumption coefficient from the following formula (1).

[0022]

[A-one number]

In addition, not only the gestalt of the above-mentioned implementation but various change is possible for the activity evaluation testing device of this invention. For example, the inflow valve 12 can be made to be placed between inhalant canals 8, an inhalant canal 8 is made opened for traffic by opening this inflow valve 12, although the closedown of the inhalant canal 8 is carried out by closing the inflow valve 12, an inhalant canal 8 can be made into a breather valve, and an inhalant canal 8 can be wide opened to the atmospheric air by opening this valve, and it can also prevent that the mixed liquor of the microorganism mixing chamber 2 flows into a reactor 4 by it. In this case, it is necessary to install the installation position of a breather valve in a position higher than the opening position of the interconnecting tube 14 in a reactor 4. Moreover, the operation timing of each valve can also be suitably changed in the domain which can attain the purpose of this invention.

[0023]

[Example] The example of instrumentation of the oxygen consumption coefficient by the above-mentioned activity evaluation testing device is shown in drawing 2 . This example extracts the mixed liquor of the support (3mm angle) which fixed the nitrifying bacterium, and a suspension activated sludge from nitrification of the sewage and the nitrification tub of a denitrification treatment process. At the time (first stage) of instrumentation start, it is O2 in the gas of a reactor. Concentration (% display) shows the 21 almost same% as the atmospheric air, falls in connection with advance of a microorganism reaction, and has reached to about 17% 30 minutes after. About 5mg / L are shown in early stages, it is reached and made 6mg / L 30 minutes after, and DO concentration is **. It is an

oxygen consumption coefficient Kr on the basis of each measurement value in every 20 seconds, VL =1.6L, and VG =0.4L. Similarly the computed result is shown in drawing 2 . Kr About 30mg / L.h are shown in early stages, it falls with the passage of time, and the result stabilized by about 10mg / L.h was obtained about 20 minutes after.

[0024] Moreover, in the above-mentioned activity evaluation testing device, the abnormalities of the indicated value of DO meter conventionally seen by equipment were cancelable in the reduced pressure status of 400 - 600Torr. In addition, when the reduced pressure status continues 2 minutes or more in 400 or less Torrs, it is O2 out of the liquid in a reactor. In order to separate and for the DO concentration of liquid itself to change, it is desirable to avoid such operation.

[0025]

[Effect of the invention] as mentioned above, in the activity evaluation testing device of this invention Since the mixed liquor of a microorganism mixing chamber is introduced to the reactor by using negative pressure, without passing a pump Sublation of the microorganism fixed the breakdown, the carrier surface, or inside the microorganism, and wear of the support [itself], [in mixed liquor] [of flocks] O2 of DO concentration of microorganism mixed liquor, and the up gaseous-phase section further extracted to the reactor, without producing a breakdown At the time of instrumentation start of change of concentration DO meter and O2 It is the indicated value of the total, respectively O2 in DO concentration in early stages of mixed liquor, and the atmospheric air By doubling with concentration certainly, an oxygen consumption coefficient is measurable with a quickly sufficient precision.

CLAIMS

[Claim]

[Claim 1] When a reactor has a means to measure the dissolved oxygen (DO) concentration in internal liquid, and the oxygen (O2) concentration in up gas and makes the inside of the aforementioned reactor the reduced pressure status It is constituted so that constant-rate extraction of the microorganism mixed liquor may be carried out into the aforementioned reactor from an external microorganism mixing chamber. It is O2 in DO concentration of mixed liquor, and gas, circulating through the gas sealed by the aforementioned reactor upper part in mixed liquor from the time of an extraction end of the mixed liquor to the aforementioned reactor. Activity evaluation testing device characterized by evaluating microorganism activity by measuring change of concentration.

[Claim 2] When the aforementioned reactor is connected with the reduced pressure tank with a capacity larger than the capacity, decompresses the aforementioned reduced pressure tank at the time of extraction of microorganism mixed liquor and attracts microorganism mixed liquor subsequently to in the aforementioned reduced pressure tank in the aforementioned reactor from the exterior An activity evaluation testing device given in the claim 1 characterized by constituting so that the indicated value of DO meter with which the reactor was equipped may be doubled with DO concentration of mixed liquor, replacing the mixed liquor in the aforementioned reactor with the mixed liquor from the exterior.

[Claim 3] An activity evaluation testing device given in the claim 2 characterized by constituting in the aforementioned reactor so that constant-rate extraction of the mixed liquor may be carried out by doubling with the liquid level of the mixed liquor in the aforementioned reactor the position of the interconnecting tube which connects the aforementioned reactor and the aforementioned reduced pressure tank.

[Claim 4] An activity evaluation testing device given in the claims 1, 2, or 3 characterized by returning the pressure of the gas section decompressed by attracting the open air among the up gas section of the aforementioned reactor at the time of an extraction end of microorganism mixed liquor to atmospheric pressure.